



**COST-PLUS-FIXED FEE
RESEARCH & DEVELOPMENT CONTRACT**

Contract No. TBD

BETWEEN

**CALIFORNIA INSTITUTE OF TECHNOLOGY
JET PROPULSION LABORATORY
(The "Institute" or "JPL")
4800 OAK GROVE DRIVE
PASADENA, CALIFORNIA 91109-8099**

AND

TBD

THIS CONTRACT FOR

**MARS RECONNAISSANCE ORBITER
(MRO)**

IS A

SUBCONTRACT UNDER JPL's NASA PRIME CONTRACT

TASK ORDER NO. TBD

A DO - C9 Rating is assigned to this Contract under DMS Regulation 1

**Specimen Contract
Dated: April 24, 2001**

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The following documents are incorporated into and made a material part of this contract.

GENERAL PROVISIONS: Cost-Reimbursement with Commercial Organizations Contract R 5/00, with Incorporated Exhibits.

- Management of Government Property in the Possession of Contractors, Form JPL 0968
- Release of Information, Form JPL 1737
- Affiliate Access Report, Form JPL 1943
- Notification to Prospective Contractors of JPL's Ethics Policies and Anti-Kickback Hotline, Form JPL 2385
- Certifications of Nonsegregated Facilities, Clean Air and Water, Anti-Kickback Compliance, Americans with Disabilities Act Compliance, Certification and Disclosure Regarding Payments to Influence Certain Federal Transactions, Certification of Full Disclosure Regarding Debarred, Suspended, or Proposed for Debarment Status, or Proposed for Debarment Status, and Certification of Toxic Chemical Release Reporting, Form JPL 2892
- Asbestos Notification, Form JPL 2895

ADDITIONAL GENERAL PROVISIONS (AGPs)

Cost Accounting Standards and Administration of Cost Accounting Standards R 4/99

Or

Disclosure and Consistency of Cost Accounting Practices, and Administration of Cost Accounting Standards R 4/99

Flight Systems or Subsystems-Overtime 3/01

Foreign Travel Reporting Requirements R 4/99

Frequency Authorization R 4/99

Government Property R 4/99

New Technology R 4/99

Or

Patent Rights-Retention By the Contractor (Short Form) R 4/99

Safety and Health R 4/00

Security Requirements for Unclassified Automated Information Resources and Access to JPL's Controlled Facilities R 5/00

Waiver of Facilities Capital Cost of Money R 4/99

PREAMBLE

This Contract, entered into on _____ by and between the CALIFORNIA INSTITUTE OF TECHNOLOGY (hereinafter called the “Institute” or “JPL”), a corporation organized and existing under the laws of the State of California, and TBD (hereinafter called the “Contractor”), a corporation organized and existing under the laws of the State of TBD and constituting a subcontract under Prime Contract NAS7-1407 between the Institute and the Government;

WITNESSETH THAT:

The Contractor agrees to furnish and deliver the supplies and perform the services set forth in this Contract for the consideration stated herein.

SCHEDULE

ARTICLE 1. STATEMENT OF WORK AND DELIVERY INSTRUCTIONS

On or Before

1.0 Phase A/B – System Definition and Preliminary Design

The Contractor shall provide the resources necessary to define and complete the definition of the design, development, manufacture, test and verification of an Orbiter system that accommodates the NASA/JPL-provided science and engineering payloads, in accordance with the requirements set forth in Exhibits I through VI, to support the Mars Reconnaissance Orbiter 2005 Project. In the performance of this effort, the Contractor shall:

12 Months After Date of Contract (ADOC).

1.1 Orbiter Design and Development

Perform preliminary design tradeoffs and analyses to establish an Orbiter baseline design that provides the required performance and accommodations for science and engineering payloads as defined in Exhibit I.

1.1.1 Conduct Orbiter system/subsystem tradeoff studies, design, and analyses including but not limited to the following:

1.1.1.1 Propulsion vs. Aerobraking: With the objective of reaching the final mapping orbit in the shortest time after arrival at Mars, perform an analysis and feasibility study of the benefits, Orbiter impacts, risk and cost impact of using propulsive techniques instead of aerobraking to arrive at a final primary science orbit.

1.1.1.2 Mission Phases/Critical Events: Definition of each mission phase and for critical events including as a minimum trajectory correction maneuvers, Mars orbit insertion and aerobraking, primary science phase and relay phase (approach navigation, Entry Descent Lander (EDL) tracking, and relay from surface assets).

1.1.2 Generate detailed Orbiter system/subsystem functional, design and performance specifications with verification matrices.

1.1.3 Develop Orbiter and Payload design/test environments for all mission phases.

1.1.4 Develop preliminary launch vehicle interface definitions and develop and deliver launch vehicle related documentation in accordance with the JPL approved plan in Exhibit III, LV-001.

1.1.5 Develop preliminary definition of Assembly, Test and Launch Operations (ATLO) testbed(s). Identify, and upon receipt of JPL

approval, procure long-lead testbed elements.

1.1.6 Identify and, upon receipt of JPL approval, procure long-lead parts.

1.2 Payload Accommodation and Interface Definition

Conduct and coordinate Orbiter interface definition activities with Payload providers and JPL to develop the science and engineering payload accommodation approach and generate preliminary interface designs, specifications and agreements including, as a minimum, the following:

1.2.1 Perform configuration tradeoffs and analyses to establish accommodations for each payload, including the evaluation and assessment of interactions between instruments.

1.2.2 Prepare, maintain and update as necessary interface control documentation for each payload element in accordance with Exhibit III.

1.2.3 Incorporate Payload-provided mechanical configuration, structural and thermal models with Orbiter models and provide relevant integrated model results to Payload providers.

1.2.4 Conduct planning and coordination with payload providers and JPL to establish Payload and Orbiter interface design verification, test plans and requirements during Assembly, Test and Launch Operations (ATLO).

1.3 Mission Operations

1.3.1 Participate with and support JPL Mission Operations architecture and interface definition activities.

1.3.2 Generate and deliver preliminary mission operations plans, requirements and support concepts in accordance with Exhibits I, III and IV.

1.3.3 Perform preliminary design and development of the Orbiter Analysis Software.

1.4 Level-of Effort Special Studies and Support

Provide, on a level-of-effort basis, up to 1,000 equivalent work hours of engineering direct labor to support (in addition to those specified under paragraph 1.1.1) various Orbiter studies as directed in writing by the Cognizant JPL Negotiator.

1.5 Program Management and Reporting

1.5.1 Establish a management system and organization to support the requirements of this Contract.

requirements of this Contract.

- 1.5.2 Assign a Program Manager who is responsible for all Contractor effort and shall have authority commensurate with that responsibility.
- 1.5.3 Implement a reporting program between JPL and Contractor representatives at the Contractor's facility (or by other means mutually agreeable to JPL and the Contractor) in accordance with Exhibit III.
- 1.5.4 Prepare, update and maintain a listing of program risk items including technical, schedule and cost risks, and provide risk mitigation options and cutoff dates in accordance with Exhibit III.

1.6 Meetings and Reviews

Conduct or support meetings and reviews with JPL, payload providers, NASA and other project participants in accordance with Exhibit III, including the following:

- 1.6.1 Conduct and participate in splinter meetings between JPL and Contractor representatives at the Contractor's facility (or by other means mutually agreeable to JPL and the Contractor). Monthly
(1 day prior to the MMR)
- 1.6.2 Each month, prepare for, and conduct at the Contractor's facility, (or by other means mutually agreeable to JPL and the Contractor), a Monthly Management Review (MMR) with a 1-day duration in accordance with an agenda mutually agreed upon in advance with the CTM. Monthly
(second Thursday after close of Contractor's fiscal month)
- 1.6.3 Conduct an Inheritance Review at Contractor's facility to assess the inheritance status of existing designs/hardware/software for use on MRO. Eight (8) Months
ADOC.
- 1.6.4 Conduct, in conjunction with the payload providers, an Instrument Accommodation and Cost Review to assess the payload accommodations/interface status and issues. Three (3) Months
ADOC.
- 1.6.5 Conduct subsystem Preliminary Design Reviews and/or subsystem peer reviews in accordance with the JPL approved Review Plan.
- 1.6.6 Participate in key meetings at the payload provider's facilities. As Needed
- 1.6.7 Participate in and support key JPL project and NASA meetings and reviews including the following:
 - 1.6.7.1 System Requirements/Capabilities Review at JPL to assess the accuracy and completeness of preliminary requirements definition and the capability of the design to meet the requirements. Three (3) Months
ADOC

- | | | |
|---------|---|-------------------|
| 1.6.7.2 | Preliminary Mission and System Review/Initial Confirmation Review at JPL. | Five Months ADOC. |
| 1.6.7.3 | Quarterly Reviews at JPL | Quarterly |
| 1.6.7.4 | Project Preliminary Design Review and Confirmation Readiness Review at JPL to present a summary of Orbiter subsystem PDR/peer review results and Orbiter implementation plans. [Note the Orbiter PDR has been incorporated into this review.] | 11 Months ADOC |
| 1.6.7.5 | Other reviews and meetings as requested by JPL. | As Needed |
- 1.7 Program Plans and Data
- 1.7.1 Prepare and submit all data to JPL as defined in Exhibit III, "Contract Plans and Documentation".
- 1.7.2 Implement provisions of the plans required in Exhibit III subsequent to JPL approval.
- 1.8 Non-Escort and Electronic Access Privileges
- Grant specific JPL personnel non-escort privileges to all areas of the Contractor's facility where work is being performed under this Contract and read-only electronic access (access by computer from JPL or other locations as mutually agreed upon) to the Contractor's computer databases being generated in the performance of this Contract.
- 1.9 Contractor-Provided Facilities
- Provide at the Contractor's facility office space, desks, chairs, telephones, secretarial services, reproduction, FAX and internet access (with provisions to get through contractor firewalls to JPL) for use by four (4) JPL representatives during the performance of this contract.
- 1.10 Technical Direction Memorandum
- Accept "in-scope" technical direction provided via Technical Direction Memorandum (TDM), JPL Form 2084-S. Such direction shall be accepted only from the JPL Contract Technical Manager (CTM).
- 1.11 Data, Records and Storage
- Establish and maintain an electronic server-based, configuration-controlled and access-protected database system accessible by internet to JPL representatives for all Contractor-generated data and documentation identified in Exhibit III, CM-002, Master Data List.
- 1.12 Based on the efforts accomplished in Phase A/B, prepare and deliver a delta Phase C/D/E Implementation Plan (in accordance with Exhibit III) and a
- Three Months Prior to PDR

Phase C/D/E Delta-Cost Proposal with rationale to support the changes.

1.13 The following Exhibits are hereby incorporated into and made a part of this Contract:

- 1.13.1 Exhibit I Orbiter Requirements, dated April 16, 2001
- 1.13.2 Exhibit II Applicable/Reference Documents List, dated April 24, 2001
- 1.13.3 Exhibit III Contract Plans and Documentation, dated April 24, 2001
- 1.13.4 Exhibit IV Mission Operations Requirements, dated April 16, 2001
- 1.13.5 Exhibit V Government Furnished Property List, dated April 24, 2001
- 1.13.6 Exhibit VI Interface Roles and Responsibilities, dated April 24, 2001

OPTION 1

2.0 Phase C/D – Detailed Design, Manufacture and Test

The Contractor shall provide the resources necessary to deliver the flight Orbiter, Orbiter spares, necessary ground software/support equipment and special tooling; integrate payloads, lead and support integration activities, support launch operations and support mission operations in accordance with the requirements set forth in Exhibits I through VI for the Mars Reconnaissance Orbiter. In performance of this effort, the Contractor shall: Launch plus 30 days

2.1 Design and Development

- 2.1.1 Provide continuation of all Phase C/D efforts initiated under Section 1.0 Phase A/B to finalize the Orbiter design, requirements definition, payload accommodations and interfaces, and to finalize the manufacturing, integration, test, verification, and launch operations plans.
- 2.1.2 Develop detailed launch vehicle interface requirements, analyses and data and support JPL and the launch vehicle provider to complete all required launch vehicle analyses, studies, reports, procedures, sequences and related interface documentation per Exhibit III.
- 2.1.3 Develop, verify and maintain testbed(s) as necessary to verify flight software functions, subsystem and payload interface functions, timing interactions and fault identification and response routines.
 - 2.1.3.1 Integrate Engineering Model (EM) Payloads (in accordance with Exhibit III, Orbiter-Payload ICDs) with testbed(s) to

verify and evaluate Orbiter-Payload electrical interfaces, command and telemetry performance.

- 2.1.4 Specify, develop, verify and maintain one (1) Orbiter testbed and software simulator in accordance with Exhibit IV, including all required support equipment, for use with JPL and Contactor mission operation systems. Incorporate remote access provisions in the testbed design to allow for remote use in support of operations.
 - 2.1.4.1 Deliver one (1) MOS Orbiter testbed to JPL, integrate with JPL MOS and verify functionality. [Note: The testbed may be delivered in place as mutually agreed between JPL and the Contractor.] Coincide with the Orbiter shipment to KSC.
- 2.1.5 Deliver alignment cubes and Orbiter interface connectors to payload providers (for all of their delivered units).
- 2.1.6 Specify, develop, maintain and ship ground support equipment (including test and control instrumentation, software, ground handling and lift fixtures, special tooling, special test equipment and shipping containers) required to manufacture, integrate, test, calibrate, ship and prepare the Orbiter system for launch.
- 2.1.7 Deliver all residual flight spare hardware, including flight electronic parts, and ground support equipment, including test and control instrumentation, software, ground handling and lift fixtures, special tooling, special test equipment and shipping containers. Delivery to include all appropriate documentation to allow for future use.
- 2.1.8 Support flight software Independent Verification and Validation (IV&V) to assess adequacy of specifications and software design compliance and verification approach.
- 2.1.9 Deliver flight software source code, libraries, makefiles, and instructions necessary to allow JPL to rebuild the flight executable image.
- 2.2 Manufacture, assemble and test one (1) flight Orbiter, in accordance with Contractor-developed fabrication, assembly, test, verification and calibration documentation including JPL-approved plans, specifications, procedures, drawings and analyses.
- 2.3 Integrate and test the Science and Engineering Payloads with the flight Orbiter in accordance with Contractor-developed integration and test plans, procedures, drawings and specifications in accordance with Exhibit III. Use the JPL-supplied command and telemetry processing system for Orbiter integration, test and launch operations activities.
 - 2.3.1 Provide suitable facilities, and handling and transportation support for storage, pre-integration checkout, testing, and integration of

individual payloads.

- 2.3.2 Demonstrate compatibility of the Orbiter telecommunications subsystem with the Deep Space Network (DSN).
- 2.3.3 Demonstrate compatibility of the Orbiter with the Mission Operations System (MOS/GDS).
- 2.3.4 Develop test sequences and perform end-to-end testing to demonstrate command, telemetry and data flow between the Orbiter, payloads, DSN and MOS/GDS mission elements.

2.4 Orbiter Delivery, Launch Vehicle Integration and Launch Operations

- 2.4.1 Participate in launch site operations planning activities and prepare Orbiter inputs for launch preparation plans, procedures and sequences as well as other required launch vehicle and ATLO documentation per Exhibit III.
- 2.4.2 Ship the Orbiter in accordance with Contractor-prepared shipping plans.
- 2.4.3 Perform post-delivery Orbiter verification testing and support the integration of the Orbiter with the launch vehicle at the launch site.
- 2.4.4 Conduct launch site operations for the Orbiter and payloads at Kennedy Space Center (KSC) in accordance with Exhibit II including monitoring Orbiter health, and performing required Orbiter fueling/defueling and maintenance operations before encapsulation and stacking. Support Orbiter operations during encapsulation and stacking, monitoring and reporting Orbiter launch readiness/health before liftoff and during launch. Launch
- 2.4.5 Support mission operations and anomaly response team activities from initial acquisition through end of the launch plus 30 days Orbiter checkout period. End of GFY '05

2.5 Mission Operations

- 2.5.1 Prepare Orbiter Analysis and Operations Plan in accordance with Exhibit III. Define requirements and coordinate with JPL MOS personnel to establish detailed interface specifications and agreements.
- 2.5.2 Prepare Orbiter plans and procedures including contingency procedures, command and telemetry dictionaries, flight rules constraints and idiosyncrasies documentation, sequences and scripts in accordance with Exhibit III.

- 2.5.3 Participate with the JPL MOS team in all operations planning and preparation activities, including:
 - 2.5.3.1 MOS Scenario development
 - 2.5.3.2 MOS processes and procedures development.
 - 2.5.3.3 Operations interfaces specifications and software interface specifications.
 - 2.5.3.4 MOS and GDS testing, training and rehearsals.
 - 2.5.3.5 Development of operations handbook and training materials.
- 2.5.4 Specify and develop Orbiter Analysis Software (OAS) in accordance with the Contractor-prepared, JPL-approved Orbiter Analysis Software Implementation Plan as defined in Exhibit III. Launch Minus 6 Months
- 2.5.5 Support the JPL MOS team to:
 - 2.5.5.1 Integrate the OAS and testbed into the JPL MOS/GDS.
 - 2.5.5.2 Perform compatibility and verification tests with the Contractor-provided testbed.
 - 2.5.5.3 Integrate and test JPL MOS/GDS compatibility with the Orbiter.
- 2.5.6 Maintain and update as required Contractor-provided MOS/GDS items including hardware, software and documentation.

2.6 Level-of-Effort Special Studies and Support

Provide on a level-of-effort basis up to 2,000 equivalent work hours of engineering direct labor to support various Orbiter development tasks as directed in writing by the Cognizant JPL Negotiator.

2.7 Program Management and Reporting

- 2.7.1 Maintain a management system and organization to support the requirements of this Contract.
- 2.7.2 Provide continuity from Phase A/B through Phase C/D with key personnel.
- 2.7.3 Continue to conduct and participate in monthly reporting meetings between JPL and Contractor representatives at the Contractor's facility in accordance with Exhibit III.

- 2.7.4 Update and maintain a listing of program risk items including technical, schedule and cost risks, and provide risk mitigation options and cutoff dates in accordance with Exhibit III.

2.8 Meetings and Reviews

Continue to conduct or support meetings and reviews with JPL, payload providers, NASA and other project participants, in accordance with Exhibit III, including:

- | | | |
|---------|---|---|
| 2.8.1 | Conduct and participate in splinter meetings as specified in paragraph 1.6.1. | Monthly
(1 day prior to the MMR) |
| 2.8.2 | Each month, prepare for and conduct MMRs as specified in paragraph 1.6.2. | Monthly
(second Thursday after close of Contractor's fiscal month) |
| 2.8.3 | Conduct subsystem Critical Design Reviews and/or subsystem peer reviews in accordance with the JPL-approved Review Plan. | |
| 2.8.4 | Conduct an ATLO Readiness Review at the Contractor's facility to assess flight system readiness to proceed with system-level test activities. | |
| 2.8.5 | Conduct a Pre-Environmental Review at the Contractor's facility to assess readiness for flight system environmental testing, and MSA and facility readiness to support the testing. | |
| 2.8.6 | Conduct a Pre-Ship Review at the Contractor's facility to assess readiness for shipment of the Orbiter and supporting elements to the launch site. | |
| 2.8.7 | Participate in meetings at payload provider's facilities. | As Needed |
| 2.8.8 | Participate in and support JPL Project and NASA meetings and reviews including: | |
| 2.8.8.1 | Quarterly Reviews at JPL (assume 2 days duration) | Quarterly |
| 2.8.8.2 | Project Critical Design Review at JPL to present a summary of Orbiter subsystem CDR/peer review results and ATLO plans. [Note: The Orbiter CDR has been combined into this review.] | 20 months ADOC |
| 2.8.8.3 | Flight Readiness Review to assess readiness of flight systems for launch and mission operations activities. | Launch minus 5 days |

2.8.8.4	Mission Operations PDR to assess the MOS preliminary design.	15 Months ADOC
2.8.8.5	Mission Operations CDR to assess the MOS detailed design.	27 Months ADOC
2.8.8.6	Two (2) NASA Red Team Reviews at Contractor's facility each consisting of up to 16 teams of not more than 80 engineers total to perform in-depth, informal engineering discussion, evaluation and review of Contractor's Orbiter design and verification plan and MOS support activities. Review durations are three (3) days with action item follow-up covering an additional two (2) weeks.	30 Months ADOC and 37 Months ADOC (estimated)
2.8.8.7	Mission Operational Readiness Review (ORR)	Launch minus 60 days
2.8.8.8	Mission Readiness Review (MRR)	Launch minus 30 days
2.8.8.9	Mission Risk Assessment Review (RAR)	Launch minus 30 days
2.8.8.10	Post-Launch Acceptance/Assessment Review	Launch plus 3 weeks
2.8.8.11	Other reviews and meetings as requested by JPL.	

2.9 Program Plans and Data

Prepare and submit all data as specified in paragraph 1.7.

2.10 Non-Escort and Electronic Access Privileges

Grant specific JPL personnel non-escort privileges as specified in paragraph 1.8.

2.11 Contractor-Provided Facilities

2.11.1 Provide at the Contractor's facility office space, desks, chairs, telephones, secretarial services, reproduction, FAX and internet access (with provisions to get through contractor firewalls to JPL) for use by ten (10) JPL representatives during the performance of this contract. The facility and network shall meet JPL flight operations security requirements as defined in Exhibit IV.

2.11.2 Provide at the Contractor's facility office space, desks, chairs, telephones, secretarial services, reproduction, FAX and internet (with provisions to get through contractor firewalls) access for use by fourteen (14) payload representatives during the payload integration and Orbiter test period.

2.11.3 Provide suitable clean room facilities, including power, internet connections, and environmental controls for post-delivery processing

connections, and environmental controls for post-delivery processing of payload hardware and GSE by payload provider personnel. (Specific clean room requirements will be determined after selection of payloads—for proposal purposes, assume clean areas in accordance with the requirements for Class 10,000 clean rooms per Federal Standard No. 209. Limit access to those persons necessary for proper operation of clean room areas).

2.12 Technical Liaison

2.12.1 Accept “in-scope” technical direction provided via TDM as specified in paragraph 1.10.

2.12.2 Maintain technical liaison between JPL’s CTM and Orbiter System Engineer, and the Contractor’s equivalent personnel to permit JPL’s timely involvement in relevant technical meetings, technical reviews and problem-solving sessions at the Contractor’s facility.

2.12.2.1 Provide timely notification to JPL representatives of all meetings concerning this Contract including technical reviews, planning meetings, problem solving sessions and meetings with subcontractors.

2.12.2.2 Provide JPL representatives with data relating to analyses and other technical matters directly pertaining to the work being performed.

2.12.2.3 Notify JPL representatives of any significant problems that arise.

Within 2 days of occurrence

2.13 Data, Records and Storage

2.13.1 Update and maintain an electronic server-based, configuration-controlled and access-protected database system accessible by internet to JPL representatives for all Contractor-generated data and documentation identified in the Exhibit III CM-002, Master Data List

2.14 Based on the efforts accomplished in Phase C/D, provide a Phase E Implementation Plan (in accordance with Exhibit III) and a delta cost proposal, supporting rationale for the changes, and definitive statement of work for Phase E that includes mission operations support from thirty days after launch (end of GFY’05) through end of prime mission.

May 2005

Option 2

3.0 Phase E – Operations

Provide the resources necessary to support the JPL mission operations team to operate the MRO Orbiter in accordance with the requirements set forth in Exhibits I through VI. In performance of this effort, the Contractor shall:

December 26, 2010

- 3.1 Establish a management system and organization to support the requirements of this Contract.
- 3.2 Assign an Orbiter Operations Manager who is responsible for all Contractor effort and shall have authority commensurate with that responsibility.
- 3.3 Perform engineering monitoring, tracking and analysis of all Orbiter functions and performance, and summarize results in daily reports in accordance with Exhibit IV.
- 3.4 Provide support to the JPL MOS team to develop and verify Orbiter command sequences.
- 3.5 Maintain and update as necessary MOS/GDS hardware and software at the Contractor's facility and/or at JPL.
- 3.6 Support the JPL MOS team to develop plans, procedures, timelines, rehearsals, sequences and contingencies for critical events such as Trajectory Correction Maneuvers (TCMs), Mars Orbit Insertion (MOI) and aerobraking maneuvers.
- 3.7 Prepare and verify Flight Software (FSW) changes as needed.
- 3.8 Notify JPL immediately in response to unexpected off nominal Orbiter conditions.
- 3.9 Perform analyses and ground tests as necessary to verify in-flight anomalous behavior and performance, and to determine and verify corrective actions. Use a Problem/Failure Report (P/FR) or equivalent process to document in-flight anomalies and the evaluation and corrective actions.
- 3.10 Complete other activities in support of Mission Operations in accordance with Exhibit IV.
- 3.11 Level-of Effort Special Studies and Support

Provide on a level-of-effort basis up to 1,000 equivalent work hours of engineering direct labor to support various Orbiter development tasks as directed in writing by the Cognizant JPL Negotiator.

3.12 Technical Liaison

- 3.12.1 Accept "in-scope" technical direction provided via TDM as specified in paragraph 1.10.
- 3.12.2 Maintain technical liaison between JPL's CTM and Orbiter System Engineer, and the Contractor's equivalent personnel to permit JPL's timely involvement in relevant technical meetings, technical reviews and problem-solving sessions at the Contractor's facility.
 - 3.12.2.1 Provide timely notification to JPL representatives of all meetings concerning this Contract including technical

meetings concerning this Contract including technical reviews, planning meetings, problem solving sessions and meetings with subcontractors.

3.12.2.2 Provide JPL representatives with data relating to analyses and other technical matters directly pertaining to the work being performed.

3.12.2.3 Notify JPL representatives of any significant problems that arise.

Within 2 days of occurrence

4.0 JPL will:

All Phases

- 4.1 Provide JPL documents listed in Exhibit II.
- 4.2 Review and approve or disapprove within 20 working days after receipt at JPL (unless otherwise specified), documents submitted by the Contractor in response to Exhibit III requirements, other than PFRs.
- 4.3 Attend and participate, as appropriate, in Contractor and subcontractor reviews, and critical technical discussions.
- 4.4 Identify the selected launch services provider and provide launch vehicle environments.
- 4.5 Provide, at JPL's discretion, Systems, Quality and Reliability Assurance engineers to reside at the Contractor's facility to support Phases A/B, C/D and E activities.
- 4.6 Provide technical direction as applicable and necessary to the Contractor from the CTM via an approved Technical Direction Memorandum (TDM).
- 4.7 Provide Mission Assurance support in accordance with the Mission Assurance Plan.

Phase A/B

- 4.8 Approve the purchase of long-lead Phase C/D electronic and/or testbed parts.
- 4.9 Provide engineering support to the Contractor's design, interface definition and integrated product teams.

Option Phase C/D

- 4.10 Provide Government Furnished Property as set forth in Exhibit V.
- 4.11 Participate in Contractor MRBs and related meetings.
- 4.12 Provide engineering support to the Contractor's design, interface definition and integrated product teams.

- 4.13 Provide a secure, high-speed Ethernet connection and voicelines between the Contactor's facility and JPL's MOS facility to support both ATLO and operations.
- 4.14 Provide training and support in the use of JPL's AMMOS software.
- 4.15 Support compatibility testing with the DSN.
- 4.16 Provide facilities, as necessary, to support launch site operations including payload and Orbiter checkout, launch vehicle integration and launch operations through the end of GFY'05.

Option Phase E

- 4.17 Provide and maintain flight operations computer hardware and network.
- 4.18 Provide and maintain AMMOS software.
- 4.19 Coordinate engineering and science operations activities.
- 4.20 Provide DSN-related capabilities.
- 4.21 Provide Mission Operations Assurance support.
- 4.22 Provide Mission Management support.
- 4.23 Manage overall Mission Operations activities.

5.0 Delivery Instructions

- 5.1 Except as otherwise provided in this Contract, the point of inspection, acceptance and delivery of all supplies deliverable under this Contract shall be the Jet Propulsion Laboratory, 4800 Oak Grove Drive, Pasadena, California 91109. All such supplies shall be packaged, packed, boxed or crated in such a manner to ensure safe delivery and shall be shipped prepaid and at the Contractor's expense to the point of delivery.
- 5.2 Time is of the essence in the performance of this Contract.
- 5.3 The Contractor shall provide the Contracting Officer (CO) the annual and final reports of reportable items described in the article entitled "New Technology." Copies of transmittal letters for those reports shall be sent to the JPL Office of Patents and New Technology (OPANT) and to the cognizant JPL negotiator.

Or

The Contractor shall provide the CO the annual and final reports of subject inventions described in the Article entitled "Patent Rights—Retention by the Contractor (Short Form)." Copies of transmittal letters

shall be sent to the JPL Office of Patents and New Technology (OPANT) and to the cognizant JPL negotiator.

5.4 Point of Delivery

5.4.1 The Orbiter shall be shipped to KSC, Florida.

5.4.2 The Orbiter FOB point shall be at launch.

ARTICLE 2. ALLOWABLE COST, FIXED FEE AND PAYMENT

1.0 Estimated Cost, Target Cost, Fixed Fee, Cost Incentive Fee and On-Orbit Incentive Fee.

	Phase A/B	Option Phase C/D	Option Phase E
1.1 Estimated Cost:	\$TBD	\$TBD	\$TBD
1.2 Target Cost		\$TBD	
1.3 Fixed Fee	\$TBD		
1.4 Cost Incentive Fee		\$TBD	
1.5 On-Orbit Incentive Fee		\$TBD	
1.6 TBD Fee			\$TBD
1.7 Total Cost	\$TBD	\$TBD	\$TBD

1.8 The total amount allotted to this Contract is \$TBD.

1.9 Subject to any equitable adjustment which is otherwise provided for under the provisions of this Contract, and except as otherwise provided for herein, the amount of fixed fee stated in paragraph 1.3 of this Article shall remain constant for the performance of the work under this Contract. There shall be no adjustment in the amount of fixed fee or any claim for increased fixed fee because of errors or omissions made in computing the estimated cost or the fact that the actual cost varies from the estimated cost.

1.10 Except for “small changes,” as provided for in this Contract, the estimated cost and fixed fee shall be subject to adjustment when the scope of work under this Contract is increased or decreased by Contract modification.

2.0 Technical Support, Level-of-Effort Requirements

2.1 A total amount of \$TBD has been established for the level-of-effort tasks set forth in Article 1, Statement of Work and Delivery Schedule, paragraph 1.4. These level-of-effort tasks shall be considered to have been completed when either the equivalent work-hours specified in Article 1, paragraph 1.4 has been expended *or* the equivalent work-hours expended equals the total dollar amount for the tasks as set forth above.

2.2 If the Contractor is not required by JPL to provide, or if the Contractor does not provide, the specified level-of-effort equivalent work-hours set forth in Article 1, paragraph 1.4, the Institute shall be entitled, in addition to any other rights which the Institute may have under this Contract, to an equitable adjustment downward in the estimated cost of Phase A/B and in the fixed fee of Phase A/B.

2.3 For purposes of making an equitable adjustment as provided by paragraph 2.2 above, each equivalent work-hour expended in support of the level-of-effort requirements specified in Article 1, paragraph 1.4, shall be calculated by JPL at a rate of \$TBD at the cost level and at a rate of \$TBD at the fixed-fee level. The parties agree that an equivalent work-hour will have been expended either when one (1) direct labor hour has been expended *or* when other direct costs generated in the performance of a level-of-effort requirement have been incurred in an amount equal to the above-stated rate or major fraction thereof.

- 2.4 Except where the Contractor is specifically required by modification to this Contract to perform additional level-of-effort equivalent work-hours in excess of the specified level-of-effort equivalent work-hours set forth in Article 1, paragraph 1.4, provision by the Contractor of level-of-effort work-hours in excess of said specified level-of-effort equivalent work-hours, shall not be the basis for an adjustment in the amount of available Phase A/B fixed fee.
- 2.5 If, during the performance period of this Contract, JPL may require an increase or decrease in the number of equivalent work-hours set forth in Article 1, paragraph 1.4, the Contractor agrees to enter promptly into negotiations. Any Contract modification resulting from such negotiations will provide for adjustments of the Phase A/B estimated cost and fixed fee set forth in paragraph 1 above based upon the increased or decreased numbers of equivalent work-hours.

3.0 Phase C/D – Option 1

- 3.1 Subject to any equitable adjustment which is otherwise provided for under the provisions of this Contract, and except as otherwise provided for herein, the amount of Cost Incentive Fee and On-Orbit Incentive Fee available for award, or for the purposes of computing fee in the event of catastrophic failure or termination for convenience, will be the Cost Incentive Fee stated in paragraph 1.4 of this Article and the On-Orbit Incentive Fee stated in paragraph 1.5 of this Article, and the amount to actually be awarded will be determined in accordance with the provisions of sections 3.4, 3.5 and 4.0 of this Article. There shall be no adjustment in the amount of cost incentive fee or in the amount of On-Orbit Incentive Fee available nor any claim for increase to those amounts because of errors or omissions made in computing the estimated cost or the fact that the actual cost varies from the estimated cost.
- 3.2 “Target Cost” as used in this Contract, means the estimated cost for Article 1, Statement of Work and Delivery Schedule, Section 2, Phase C/D, of this Contract as originally negotiated and adjusted in accordance with paragraph 3.3 below. It will be used exclusively in connection with cost incentive fee determination, and will exclude any overrun dollars.
- 3.3 Except for “small changes,” as provided for in this Contract, the estimated cost, target cost, cost incentive fee, and On-Orbit Incentive Fee shall be subject to adjustment when the scope of work under this Contract is increased or decreased by Contract modification.
- 3.4 Cost Incentive Fee structure to be negotiated.
- 3.5 On-Orbit Incentive Fee structure to be negotiated.

4.0 Catastrophic Failure

- 4.1 Catastrophic failure of the Orbiter is defined as failure to be available to provide the JPL-furnished payload the capability to return science data at the commencement of the on-orbit science mapping/relay phase. The determination of the cause of a catastrophic failure will be made by an independent NASA Failure Review Board (FRB). The determination of the percentage of JPL/Government responsibility versus Contractor responsibility for a catastrophic failure will be made solely by JPL. The findings of the NASA FRB and JPL will be made available to the Contractor.

- 4.2 In the event of a catastrophic failure of the Orbiter system that is determined to be *solely* the responsibility of the Contractor, it is agreed that **0%** of the Cost Incentive Fee earned in accordance with the provisions of paragraph 3.4 above and **0%** of the On-Orbit Incentive Fee in paragraph 3.5 will be paid.
- 4.3 Except if paragraph 4.2 applies, in the event of a catastrophic failure of the Orbiter that is determined to *not* be the sole responsibility of the Contractor, the Contractor shall be paid a portion of the applicable On-Orbit Incentive Fee based on JPL's unilateral determination of the following factors:
- 4.3.1 Percentage of Contractor responsibility.
- 4.3.2 JPL's assessment of the performance capability of the Orbiter system prior to failure.

5.0 Technical Support Level of Effort

- 5.1 A total amount of \$TBD has been established for the level-of-effort tasks set forth in Article 1, Statement of Work and Delivery Schedule, paragraph 2.6. These level-of-effort tasks shall be considered to have been completed when either the equivalent work-hours specified in Article 1, paragraph 2.6 has been expended *or* the equivalent work-hours expended equals the total dollar amounts for the tasks as set forth above.
- 5.2 If the Contractor is not required by JPL to provide, or if the Contractor does not provide, the specified level-of-effort equivalent work-hours set forth in Article 1, paragraph 2.6, the Institute shall be entitled, in addition to any other rights which the Institute may have under this Contract, to an equitable adjustment downward in the Phase C/D estimated cost and target cost and in the sum of the Phase C/D Fixed Fee, Cost Incentive Fee, and On-Orbit Incentive Fee.
- 5.3 For purposes of making an equitable adjustment as provided by paragraph 5.2 above, each equivalent work-hour expended in support of the level-of-effort requirements specified in Article 1, paragraph 2.6, shall be calculated by JPL at a rate of \$TBD at the cost level and at the rate of \$TBD at the fee level. The parties agree that an equivalent work-hour will have been expended either when one (1) direct labor hour has been expended *or* when other direct costs generated in the performance of a level-of-effort requirement have been incurred in an amount equal to the above-stated rate or major fraction thereof.
- 5.4 Except where the Contractor is specifically required by modification to this Contract to perform additional level-of-effort equivalent work-hours in excess of the specified level-of-effort equivalent work-hours set forth in Article 1, paragraph 2.6, provision by the Contractor of level-of-effort work-hours in excess of said specified level-of-effort equivalent work-hours, shall not be the basis for an adjustment in the amount of available Phase C/D Cost Incentive fee, or On-Orbit Incentive Fee.
- 5.5 If, during the performance period of this Contract, JPL may require an increase or decrease in the number of equivalent work-hours set forth in Article 1, paragraph 2.6, the Contractor agrees to enter promptly into negotiations. Any Contract modification resulting from such negotiations will provide for adjustments of the Phase C/D estimated cost, target cost, Cost Incentive Fee and On-Orbit Incentive fee as set forth in paragraph 1 above based upon the increased or decreased numbers of equivalent work-hours.

6.0 Phase E – Option 2

6.1 Fee structure to be negotiated.

6.2 Technical Support Level of Effort

- 6.2.1 A total amount of \$TBD has been established for the level-of-effort tasks set forth in Article 1, Statement of Work and Delivery Schedule, paragraph 4.1. These level-of-effort tasks shall be considered to have been completed when either the equivalent work-hours specified in Article 1, paragraph 4.1 has been expended *or* the equivalent work-hours expended equals the total dollar amounts for the tasks as set forth above.
- 6.2.2 If the Contractor is not required by JPL to provide, or if the Contractor does not provide, the specified level-of-effort equivalent work-hours set forth in Article 1, paragraph 4.1, the Institute shall be entitled, in addition to any other rights which the Institute may have under this Contract, to an equitable adjustment downward in the Phase E estimated cost and in the Phase E fee.
- 6.2.3 For purposes of making an equitable adjustment as provided by paragraph 6.2.2 above, each equivalent work-hour expended in support of the level-of-effort requirements specified in Article 1, paragraph 4.1, shall be calculated by JPL at a rate of \$TBD at the cost level and at the rate of \$TBD at the fee level. The parties agree that an equivalent work-hour will have been expended either when one (1) direct labor hour has been expended *or* when other direct costs generated in the performance of a level-of-effort requirement have been incurred in an amount equal to the above-stated rate or major fraction thereof.
- 6.2.4 Except where the Contractor is specifically required by modification to this Contract to perform additional level-of-effort equivalent work-hours in excess of the specified level-of-effort equivalent work-hours set forth in Article 1, paragraph 4.1, provision by the Contractor of level-of-effort work-hours in excess of said specified level-of-effort equivalent work-hours, shall not be the basis for an adjustment in the amount of available Phase E fee.
- 6.2.5 If, during the performance period of this Contract, JPL may require an increase or decrease in the number of equivalent work-hours set forth in Article 1, paragraph 4.1, the Contractor agrees to enter promptly into negotiations. Any Contract modification resulting from such negotiations will provide for adjustments of the Phase E estimated cost, fee amounts set forth in paragraph 1 above based upon the increased or decreased numbers of equivalent work-hours.

7.0 Precontract Costs

There shall be no allowance for costs incurred prior to the date of this Contract. If this Definitive Contract has been preceded by a Letter Contract, the phrase “date of this Contract” as used in this paragraph (b) shall mean the effective date of the Letter Contract.

8.0 Invoices

Invoices shall be submitted, in triplicate, to Supplier Payments Section MS 601-208, 4800 Oak Grove Drive, Pasadena, California 91109-8099.

9.0 Payment of Fixed Fee

The fixed fee payable under this Contract shall be paid to the Contractor in monthly installments based upon the percentage of work completed as estimated by the Contractor and approved by JPL; subject, however, to the provisions of the "Allowable Cost and Payment" Article of this Contract.

10.0 Allowable Costs

For the purpose of determining the amounts payable to the Contractor under this Contract, the allowability of costs shall be determined in accordance with the "Allowable Cost and Payment" Article of this Contract; provided, however, that in determining the allowability of costs, the advance understandings, if any, on particular items of cost set forth below shall be given effect. In the event of any inconsistency between such advance understandings and the cost principles referred to in the "Allowable Cost and Payment" Article referenced above, the cost principles shall prevail.

10.1 Direct Costs – No advance understandings.

ARTICLE 3. OPTIONS

1.0 JPL intends to exercise Option 1 and provide the Contractor authorization to proceed with full-scale development of the MRO, provided three conditions are met:

- 1.1 Full-scale development funds are approved and released by the Government, and
- 1.2 The Contractor's Phase A/B design study demonstrates the technical and programmatic capability to execute the MRO within program constraints.
- 1.3 The delta cost proposal for Phase C/D is within cost constraints and reasonable.

2.0 Option 1 – Phase C/D

- 2.1 JPL reserves the right to unilaterally exercise Option 1 for Phase C/D prior to completion of Phase A/B, and the Contractor shall perform the work described in the option in accordance with the terms set forth herein.
- 2.2 If JPL elects to exercise this Option 1, it will do so by issuance of a Unilateral Modification to the Contract.

3.0 Option 2 – Phase E

- 3.1 JPL reserves the right to unilaterally exercise Option 2 for Phase E prior to the completion of Phase C/D and the Contractor shall perform the work described in the option in accordance with the terms set forth herein.
- 3.2 If JPL elects to exercise this Option 2, it will do so by issuance of a Unilateral Modification to the Contract.

4.0 Option for Additional Spacecraft

JPL may acquire additional orbiters/cruise stages to be used for launch opportunities in 2007, 2009 and 2011, with alternate payloads and/or launch vehicles to be specified.

ARTICLE 4. SPECIAL PROVISIONS

1.0 Key Personnel and Facilities

The personnel and/or facilities, if any, specified below in paragraph 1.1 are considered essential to the work being performed hereunder. Prior to removing, replacing, or diverting any of the specified individuals or facilities, the Contractor shall notify JPL reasonably in advance and shall submit justification (including proposed substitutions) in sufficient detail to permit evaluation of the impact on this Contract. No diversion shall be made by the Contractor without the written consent of JPL; provided, that JPL may ratify in writing the change, and such ratification shall constitute the consent of JPL required by this Article. Paragraphs 1.1 and 1.2 below may, with the consent of the Contracting parties, be amended from time to time during the course of the Contract to either add or delete personnel and/or facilities, as appropriate.

1.1 The following Contractor personnel shall be considered Key Personnel under this Contract:

<u>Name</u>	<u>Percentage of Time Assigned to Contract</u>
Program Manager	Full-time
Lead System Engineer	Full-time
TBD	Full-time
TBD	Full-time

1.2 Rent-free Use of Government Facilities

(Reserved)

2.0 Limitation of Liability – High-Value Items

Pursuant to the General Provision entitled “Limitation of Liability – High-Value Items,” the following are considered high-value items:

2.1 Orbiter

2.2 Orbiter spares

2.3 Testbeds

3.0 Conduct and Separation

All Contractor personnel working in-residence at a JPL facility will be expected to conduct themselves in accordance with JPL standards of conduct, as described in “Standards of Conduct and Procedures for Handling Contractor Personnel Problems, Discipline, and Separation,” form JPL 4412, which is incorporated into this Contract. The Contractor shall be responsible for ensuring that its personnel perform their JPL work assignments and conduct themselves in a manner acceptable to JPL. JPL may require the Contractor to separate any Contractor personnel from a JPL work assignment at any time for any lawful reason. In the event of such separation, the Contractor shall have the responsibility for reassigning or terminating such Contractor personnel.

4.0 Personnel Processing

Contractor personnel shall report to the JPL or KSC/CCAS Security Group Office for (i) check-in processing before commencing work and (ii) check-out processing when terminating. Separation check-out will include the return of all Government property and badges, documents and tools which may have been provided by JPL during each individual's performance under this Contract.

ARTICLE 5. ALTERATIONS IN THIS CONTRACT

The following alterations have been made in the provisions of this Contract:

1.0 Changes.

The Article entitled "Changes," is modified by addition of the following paragraph (g):

- (g) The parties agree that no adjustment will be made to the Contract value where a claim by either party for an adjustment under this Article entitled "Changes" would result in a decrease or increase in the Contract value of less than twenty-five thousand dollars (\$25,000.00). A claim, as used in this paragraph, shall be defined to refer to a claim based on a *separately* identifiable change. Changes shall *not* be accumulated or deferred for the purpose of reaching or avoiding the limitation stated herein.

2.0 Subparagraph (d)(2) of the Article entitled "Allowable Cost and Payment" is hereby deleted and the following is substituted:

- (2) Payment of the fee, if any, shall be made to the Contractor as specified in this Contract; provided, however, that payment of any fee awarded upon completion of the Contract, or in the absence thereof any fee awarded for the final period of the Contract, shall be withheld subject to the provisions of paragraph (i) below.
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IN WITNESS WHEREOF, the parties hereto have executed this Modification as of the day and year first above written,

CALIFORNIA INSTITUTE OF TECHNOLOGY

By _____

TBD

By _____

(Typed Name)

(Title)